INFORMATION PROCESSING SYSTEM
COMPRISING A PLURALITY OF OPERATION TERMINAL DEVICES
AND AN INFORMATION PROCESSING DEVICE

CROSS REFERENCE TO RELATED APPLICATION

[0001]   The subject application is related to Japanese Patent Application No. 2000-329595 filed on October 27, 2000 in Japan, based on which this application claims priority under the Paris Convention and the contents of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002]   The present invention relates to an information processing system such as a video game machine and a method for such processing, more specifically to an operation terminal device such as a video game machine controller or an information transmission device for transmitting information therebetween and a method for such transmission, and still more specifically to an information processing system comprising a plurality of operation terminal devices and an information processing device such as an entertainment system comprising a video game machine and a plurality of controllers, a processing program for executing such operations and a recording medium storing such processing program.

[0003]   There is known a video game machine having controller ports capable of connecting a plurality of controllers, to thereby allow a plurality of players to enjoy the same game through individually controlling such controllers.

[0004]   For a game enjoyed by a plurality of players through such individual operations of the controllers, it is necessary that the correlation between the individual game characters appearing

on a television monitor and the individual controllers for operating such game characters can be recognized by the players by themselves.

[0005]   The game will never proceed smoothly if the players cannot recognize by themselves that which game character is controlled by which controller, so that it is particularly important for such game that the correlation between the game characters and the controllers can be recognized by the players.

[0006]   It is to be noted now that the matters controlled by the controller are not limited to the game characters, and that the matters which should clearly be correlated with the controllers are again not limited to the game characters, while the above description exemplifies those for simplicity.

[0007]   In a conventional video game machine, controller ports are provided to the main unit of the game machine and controllers operated by a player are connected via cables in one-to-one manner, so that each player recognizes the correlation between a game character and a controller responsible for the operationoperating thereof by tracing the cable and confirming a position (a port number assigned to each port, for example) of a controller port to which the controller under handling by the player is connected. For example, for the case that game character "a" is operable via a first controller port by a controller, and that game character "b" is operable via a second controller port by another controller, each player can know its own controllable game character by tracing the cable and confirming a port number to which the controller is connected.

2

[0008] Some of conventional applications for the video game machine (game application program or device driver program) are known to allow the controllers in a number larger than that of the controller port by using a port duplicator (multi-tap).

[0009] Such method for recognizing ~~that~~ which controller is connected to which controller port by tracing the cable is, however, disadvantageous in that such cable tracing is labor-consuming, which makes it difficult to confirm the correlation between the controller ports and the individual controllers connected thereto in particular for the case that the video game machine and the controllers are rather distant from~~with~~ each other while being connected with long cables, or~~f~~ for the case that a large number of controllers are connected to the video game machine via tangled cables. This means that confirming the correlation between the controller operated by the player and the game character becomes difficult or labor-consuming.

SUMMARY OF THE INVENTION

[0010] It is therefore an object of the present invention to provide an information processing device and a processing method, an operation terminal device, an information transmission device and a transmission method, an information processing system, a processing program for executing such operations, and a recording medium storing such processing program, all of which allow the operator to readily recognize the correlation between the individual operation terminal devices and information operable therethrough in an information processing system comprising a plurality of operation terminal devices, an information processing

device capable of connecting such plurality of operation terminal devices, and an information transmission device for effecting information transmission between such devices, such system being typified by an entertainment system comprising a plurality of controllers and a video game machine having controller ports capable of connecting such controllers.

[0011]   According to the present invention, correlation information expressing the correlation between a plurality of operation terminal devices and information operable therethrough is generated, and such correlation information is output to such operation terminal devices.

[0012]   Such correlation information is that by which plurality of the operation terminals under connection can individually be identified, or information for symbolizing that operable through the operation terminals, both of which can preferably be displayed on display means provided to each of said operation terminal devices.

[0013]   According to such present invention, the individual operators of the individual operation terminal devices can readily recognize the correlation between such individual operation terminal devices and information operable therethrough.

[0014]   Other and further objects and features of the present invention will become obvious upon understanding of the illustrative embodiments about to be described in connection with the accompanying drawings or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employing of the invention in practice.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015]   Fig. 1 is a schematic drawing showing an exemplary constitution of a principal portion of an entertainment system according to a first embodiment;

[0016]   Fig. 2 is a flow chart showing a process flow of a controller connection management program;

[0017]   Fig. 3 is a schematic drawing showing an exemplary constitution of a video game machine having a plurality of controllers connected using a port duplicator;

[0018]   Fig. 4 is a schematic drawing showing an exemplary constitution of a principal portion of an entertainment system according to a second embodiment;

[0019]   Fig. 5 is a schematic drawing showing an exemplary constitution of a principal portion of an entertainment system according to a third embodiment;

[0020]   Fig. 6 is a flow chart showing a process flow of a controller connection management program by which controller numbers or so are transmitted for the case of one-to-multi radio connection;

[0021]   Fig. 7 is a schematic drawing showing an exemplary constitution of a principal portion of an entertainment system according to a fourth embodiment;

[0022]   Fig. 8 is a schematic drawing showing an exemplary constitution of a principal portion of an entertainment system according to a fifth embodiment;

[0023]   Fig. 9 is a schematic drawing showing a constitution of a transceiver with a switch;

[0024]   Fig. 10 is a schematic drawing showing an exemplary constitution of a principal portion of an entertainment system according to a sixth embodiment;

[0025]   Fig. 11 is a flow chart showing a process flow for the transmission of controller numbers in a transceiver with a switch according to the fifth and the sixth embodiments;

[0026]   Fig. 12 is a perspective view showing an exemplary entire constitution of the entertainment system according to the individual embodiments of the present invention;

[0027]   Fig. 13 is a perspective view showing a controller;

[0028]   Fig. 14 is a block diagram showing an exemplary internal constitution of a video game machine and a transceiver; and

[0029]   Fig. 15 is a block diagram showing an exemplary internal constitution of a controller and a transceiver.

DETAILED DESCRIPTION

[0030]   Various embodiments of the present invention will be described with reference to the accompanying drawings. It is to be noted that the same or similar reference numerals are applied to the same or similar parts and elements throughout the drawings, and the description of the same or similar parts and elements will be omitted or simplified.

First Embodiment

[0031]   Fig. 1 shows an exemplary constitution of a principal portion of an entertainment system as a first embodiment of the present invention, in which an entertainment device (e.g., a video game machine 10) and controllers (i.e., two controllers 20A, 20B in Fig. 1) as a plurality of operation terminal devices operable

by the users (players) are connected with cables **13A**, **13B**, respectively.

[0032]   In such example shown in Fig. 1, the cable **13A** is electrically connected with the video game machine **10** by inserting a plug-in connector **12A** provided on one end thereof into a controller port **11A**, and with the controller **20A** by inserting a plug-in connector **14A** provided on the other end thereof into a connection port (not shown) of the controller **20A**. On the other hand, the cable **13B** is electrically connected with the video game machine **10** by inserting a plug-in connector **12B** provided on one end thereof into a controller port **11B**, and with the controller **20B** by inserting a plug-in connector **14B** provided on the other end thereof into a connection port (not shown) of the controller **20B**.

[0033]   The controllers **20A** and **20B** have display portions **21A** and **21B**, respectively, at a position readily recognizable by the players, where details of the constitution including the appearance thereof will be described later. Such display portions **21A** and **21B** are, for example, capable of providing display recognizable by the players, and can be composed of a liquid crystal display panel, an organic or inorganic electro-luminescence (EL) panel, a segment display device, and LED (light emitting diode) or the like.

[0034]   Contents to be displayed on the individual display portions **21A** and **21B** relate to correlation information expressing the correlation between the individual controllers and game characters, which includes the numbers transmitted as being assigned to the individual controllers by the video game machine **10** (referred to as "controller number" hereinafter); icons or

symbols for identifying the individual controllers; and icons or symbols for symbolizing, for example, the game characters operable through the individual controllers.

[0035]   Now the icon symbolizing the game character refers to a real illustration thereof or an abstract expression thereof.

[0036]   The contents displayed on the display portions **21A** and **21B** are not limited to the controller numbers or character icons, but can most simply be given by a plurality of LEDs (light emitting diodes), the number of which corresponding to the number of the controllers, and allowing an LED corresponding to a specific controller number assigned to such controller to be illuminated.

[0037]   That is, it is sufficient enough for the display portions **21A** and **21B** to display at least the controller numbers or the like which are assigned by the video game machine **10** to the individual controllers **20A** and **20B**, to thereby make the players recognize them explicitly. In the exemplary case shown in Fig. 1, the controller number "1" appears on the display portion **21A** of the controller **20A**, and the controller number "2" appears on the display portion **21B** of the controller **20B**.

[0038]   Providing such display on the display portions **21A** and **21B** of the individual controllers **20A** and **20B** allows~~ensures~~ the players to confirm that which game character is controllable through the controller in their own hands.

[0039]   To enable such display of the controller numbers, character icons or the like on the display portions of the individual controllers, the video game machine **10** of this embodiment performs recognition and management of the controllers under connection,

as well as transmission of information (correlation information) to be displayed on the display portions of the individual controllers, according to an algorithm (referred to as "controller connection management program") typically expressed by a flow chart shown in Fig. 2.

[0040]   Fig. 2 shows a process flow in the video game machine for the case that the controller numbers are to be displayed on the display portions of the individual controllers. The processing shown in Fig. 2 is conducted by running the controller connection management program contained in a game application program or in a device driver program mainly on a CPU (central processing unit) of the video game machine. Constitution of an internal circuit of such video game machine will be described later.

[0041]   In the example shown in Fig. 2, upon starting of the controller connection management program, such program first prepares in step **S1** a controller registration table on, for example, a RAM (random access memory) in the video game machine, and then initializes the table.

[0042]   Processing following the step **S1** will start, for example, at a point of time when the controllers are connected to the video game machine in a power-supplied state. More specifically, as for the case of the first embodiment shown in Fig. 1, the processing can start only after the controllers **21A** and **21B** are connected to the controller ports **11A** and **11B** of the video game machine **10** via the cables **13A** and **13B**, respectively.

[0043]   Now, the controller registration table refers to a table for registering and managing the controllers whose connections to

the video game machine have been confirmed, and is designed so as to register a maximum number of the controllers available for the game application program.

[0044] For a game allowing the participation of four players for example, a maximum number of the controllers in such controller registration table can be four.

[0045] In each cell of the controller registration table, information necessary for the controller under connection to communicate with the video game machine (e.g., site of the connection, a serial number of the controller, radio communication frequency) will have been recorded.

[0046] Each cell of the controller registration table previously contains a controller number, character icon or so, which is read out by request.

[0047] The controller number or a character icon read out from such controller registration table is transmitted to the controller registered to such table, and displayed on the display portion of the controller, to thereby allow the player to confirm the correlation between the controller and the game character.

[0048] If any controller fails in communication with the major unit of the video game machine, it is assumed that such controller is disconnected from the major unit of the video game machine or such video game machine is disconnected from a power source, which results in deletion of information about such controller from the controller registration table.

[0049] Upon completion of the initialization of the controller registration table in step S1, the controller connection management

program will detect in step **S2** any operation controller unlisted in said table, where the process skips to step **S6** if no unlisted controller is detected, and goes to step **S3** if any unlisted controller is detected.

[0050]   In step **S3**, the controller connection management program will judge whether the controller registration table still has a free capacity or not (i.e., whether the table contains a maximum number of controllers or not), where the process skips to step **S6** if no capacity is available, and goes to step **S4** if any capacity is available.

[0051]   In step **S4**, the controller connection management program registers such unlisted controller into the controller registration table, and then goes to step **S5**.

[0052]   In step **S5**, the controller connection management program transmits a controller number, character icon or the like previously contained in a cell (registration site) on the controller registration table to the individual controllers connected to the video game machine.

[0053]   More specifically, for the exemplary case of the first embodiment shown in Fig. 1, information such as a controller number or a character icon assigned by the controller connection management program is transmitted from the video game machine **10** to the controllers **21A** and **21B** through the cables **13A** and **13B**, respectively.

[0054]   In the exemplary case of the first embodiment shown in Fig. 1, controller number "1" for example is sent to the controller **20A**, and controller number "2" for example is sent to the controller

20B. This allows the display portion **21A** of the controller **20A** to show the controller number "1", and the display portion **21B** of the controller **20B** to show the controller number "2". Upon completion of the process in step **S5** the process then goes to step **S6**.

[0055]   In step **S6**, the controller connection management program judges whether one or more controllers are registered in the controller registration table, where the process goes back to step **S2** for the case with no controller registered, and goes to step **S7** for the case with one or more controllers registered.

[0056]   In step **S7**, the controller connection management program communicates with the controller registered in such controller registration table, tries to fetch information about various buttons provided on the controller, details of which will be described in later, and then goes to step **S8**.

[0057]   In step **S8**, the controller connection management program judges whether such trail for fetching information about the buttons on the controller was successful or not, that is, whether the communication with the controller was successful or not, where the process skips to step **S10** for the case the communication was successful, and goes to step **S9** for the case the communication resulted in failure.

[0058]   Now according to such success/failure judgment of the communication in the foregoing steps **S7** and **S8**, the events such that the controller once succeeded in the communication was disconnected later from the major unit of the video game machine or such that a power source was disconnected can also be detected.

[0059]   In step **S9**, the controller connection management program deletes the controller which have failed in the communication from the controller registration table, and then goes to step **S10**.

[0060]   In step **S10**, the controller connection management program judges whether the communication completed between the video game machine and all of the controller registered in the controller connection management table or not, where the process goes back to step **S7** for the case the communication did not complete yet, and goes back to step **S2** for the case all processing completed.

[0061]   By virtue of such processing, the entertainment system of the first embodiment can provide recognition and management of the controllers under connection, and can provide display of a controller number or a character icon on the display portion of each controller.

[0062]   While Fig. 1 exemplifies the case in which the controller ports **11A** and **11B** of the video game machine **10** are connected to the controllers **20A** and **20B**, respectively, in an one-to-one manner using the cables, the first embodiment is also applicable for a case shown in Fig. 3, in which one-to-multi cable connection is accomplished using port duplicators **303A** and **303B**. In such case, the controller numbers or so sent by the controller connection management program installed in the video game machine **10** can be displayed on the display portion **21** provided to each of a plurality of controllers **20a** to **20h** connected via the port duplicators **303A** and **303B**.

[0063]   Fig. 3 now shows a case in which the video game machine 10 having two controller ports 11A and 11B is connected with two port duplicators 303A and 303B to thereby allow eight controllers 20a to 20h to be connected thereto.

[0064]   In such case shown in Fig. 3, the controller port 11A of the video game machine 10 is connected with the port duplicator 303A via the plug-in connector 12A and the cable 302A. The port duplicator 303A has four taps (controller connection slots) 304a to 304d to which the controllers 20a to 20d are connected respectively through the cables 305a to 305d. Similarly, the controller port 11B of the video game machine 10 is connected with the port duplicator 303B via the plug-in connector 12B and the cable 302B, and such port duplicator 303B has four taps (controller connection slots) 304e to 304h to which the controllers 20e to 20h are connected respectively through the cables 305e to 305h.

[0065]   For the case where a plurality of controllers are connected to a single video game machine as shown in the above, the controller connection management program identifies the controllers based on the tap position (tap number) of the port duplicators to which the controllers are connected. In an exemplary case shown in Fig. 3, assuming that the controller port 11A of the video game machine 10 has a port number of "1", and the controller port 11B has a port number of "2", and the taps 304e to 304h of the port duplicator 303A have tap numbers of "1" to "4", respectively, the controller connection management program assigns a controller number "1-1" to the controller 20a, "1-2" to the controller 20b, "1-3" to the controller 20c and "1-4" to the controller 20d. The

14

controller **20e** to **20h** can similarly have the controller numbers of "2-1" to "2-4". The controller connection management program transmits such controller numbers to the corresponding controllers **20a** to **20h**, which will respectively appear on the display portion **21** of the corresponding controllers **20a** to **20h**.

Second Embodiment

[0066]   Fig. 4 shows an exemplary constitution of a second embodiment in which a video game machine **30** and a plurality of controllers (i.e., two controllers **40A** and **40B** in Fig. 4) communicate with each other by one-to-one, bi-directional radio connection using transceivers.

[0067]   In such example shown in Fig. 4, a transceiver **32A** comprises a connector portion **33A** having a communication circuit incorporated therein for effecting the bi-directional radio communication and a radio communication antenna **34A**, where the connector portion **33A** of such transceiver **32A** is inserted into the controller port **31A** of the video game machine **30** to thereby accomplish electrical connection. Similarly, a transceiver **32B** comprises a connector portion **33B** having a communication circuit incorporated therein for effecting the bi-directional radio communication and a radio communication antenna **34B**, where the connector portion **33B** of such transceiver **32B** is inserted into a controller port **31B** of the video game machine **30** to thereby accomplish electrical connection.

[0068]   A transceiver **42A** comprises a connector portion **43A** having a communication circuit incorporated therein for effecting the bi-directional radio communication and a radio communication

15

antenna **44A**, where the connector portion **43A** of such transceiver **42A** is inserted into the controller port (not shown) of the controller **40A** to thereby accomplish electrical connection.

[0069]   Similarly, a transceiver **42B** comprises a connector portion **43B** having a communication circuit incorporated therein for effecting the bi-directional radio communication and a radio communication antenna **44B**, where the connector portion **43B** of such transceiver **42B** is inserted into the controller port (not shown) of the controller **40B** to thereby accomplish electrical connection.

[0070]   The individual transceivers **32A**, **32B**, **42A** and **42B** can be those available in bi-directional radio communication based on, for example, a general-purpose, short-range, high-speed radio communication system such as so-called Blue Tooth (registered trade name) or on a dedicated short-range radio communication system. In the case shown in Fig. 4, the transceivers **32A** and **42A** are involved in a one-to-one radio communication, and the transceivers **32B** and **42B** are involved in the same.

[0071]   The controllers **40A** and **40B**, the details thereof which will be described in later, have display portions **41A** and **41B** at a position readily recognizable by the players, similarly for the case of the controllers **20A** and **20B** shown in Fig. 1.

[0072]   Displays on such display portions **41A** and **41B** include controller numbers transmitted as being assigned to the individual controllers; or character icons operable through such controllers, which are displayed so as to explicitly be recognized by the players similarly to the case described in the first embodiment.

16

[0073]   Fig. 4 now exemplifies a case that a controller number of "1" is displayed on the display portion **41A** of the controller **40A**, and a controller number of "2" is displayed on the display portion **41B** of the controller **40B**.

[0074]   Also in the second embodiment, similarly to the case described in the first embodiment, such displays on the display portions **41A** and **41B** of the individual controllers **40A** and **40B** allow each player to confirm which game character is operable through the controller in its own hands.

[0075]   To enable such display of the controller numbers or character icons on the display portions of the individual controllers, the video game machine of the second embodiment recognizes and manages the controllers under connection and transmits displayed information to the display portion of the individual controllers based on a process flow described below.

[0076]   It is now to be noted that the process flow by the controller connection management program in the second embodiment is approximately the same with that explained with reference to the flow chart in Fig. 2, so that the description below will be given only about the issues different from those in the first embodiment.

[0077]   In the second embodiment, the controller connection management program starts the process of step **S1** in Fig. 2 upon establishment of the radio communication between the transceiver **32** (**32A**, **32B**) connected to the video game machine **30** and the transceiver **42** (**42A**, **42B**) connected to the controller **40** (**40A**, **40B**).

The processes from steps **S1** to **S4** are basically the same with those described in the first embodiment.

[0078]   In step **S5** of the second embodiment, the controller connection management program sends information such as the controller numbers or character icons to the controllers **40A** and **40B** through radio communication between the transceiver **32** on the side of the video game machine **30** and the transceiver **42** on the side of the controller **40**.

[0079]   In the exemplary case of the second embodiment in Fig.4, controller number "1" is sent to the controller **40A**, and controller number "2" is sent to the controller **40B**. This results in displaying controller number "1" on the display portion **41A** of the controller **40A**, and controller number "2" on the display portion **41B** of the controller **40B**. The processes from steps **S6** to **S10** are basically the same with those described in the first embodiment.

[0080]   Such processing allows the entertainment system of the second embodiment to recognize and manage the controllers under connection, and to display the controller numbers, character icons or the like on the display portions of the individual controllers.

Third Embodiment

[0081]   Fig. 5 shows an exemplary constitution of a third embodiment in which a video game machine **30** and a plurality of controllers (i.e., five controllers **41a** to **41e** in Fig. 5) communicate with each other by one-to-multi, bi-directional radio connection using transceivers.

[0082]   In such example shown in Fig. 5, the transceivers **42a** to **42e** are inserted into the controllers **40a** to **40e** to thereby

18

accomplish electrical connection, similarly to the case shown in Fig. 4.

[0083]   On the other hand, the transceivers **35A** and **35B** are inserted into the controller ports **31A** and **31B** of the video game machine **30** to thereby accomplish electrical connection, similarly to the case shown in Fig. 4. The transceivers **35A** and **35B** are now provided respectively with a communication circuit capable of one-to-multi, bi-directional communication using a plurality of transceivers on the controller side based on the time-division radio communication or frequency-division radio communication.

[0084]   The exemplary case shown in which Fig. 5, the transceiver **35A** on the side of the video game machine **30** establishes radio communication with the transceivers **42a** to **42c** on three respective controllers **40a** to **40c** (referred to as a controller group **50A**, hereinafter) in a one-to-three manner, and the transceiver **35B** establishes radio communication with the transceivers **42d** and **42e** on two respective controllers **40d** and **40e** (referred to as a controller group **50B**, hereinafter) in a one-to-two manner.

[0085]   The individual controllers **40a** to **40e** in the third embodiment have display portions **41a** to **41e** similarly to the foregoing embodiments, on which the controller numbers, character icons or so assigned by the video game machine **30** are displayed so as to explicitly be recognized by the players.

[0086]   Now in the case exemplified in Fig. 5, controller number "1" is displayed on the display portion **41a** of the controller **40a**, controller number "2" is displayed on the display portion **41b** of the controller **40b**, and similarly a controller number "3" on the

19

display portion **41c** of the controller **40c**, controller number "4" on the display portion **41d** of the controller **40d**, and controller number "5" on the display portion **41e** of the controller **40e**.

[0087]   Also in the third embodiment, similarly to the case described in the first and second embodiments, such displays on the display portions **41a** to **41e** of the individual controllers **40a** to **40e** allow each player to confirm which game character is operable through the controller in their~~its~~ own hands.

[0088]   It is now to be noted that the process flow by the controller connection management program installed in the video game machine in the third embodiment is approximately the same with that explained with reference to the flow chart in Fig. 2, so that the description below will be given only about the issues different from those in the first and second embodiments.

[0089]   In the third embodiment, the controller connection management program starts the process of step **S1** in Fig. 2 upon establishment of the radio communication between the transceivers **35A** and **35B** connected to the video game machine **30** and the transceivers **42a** to **42e** connected to the controllers **40a** to **40e**. The processes from steps **S1** to **S4** are basically the same with those described in the first and second embodiments.

[0090]   In step **S5** of the third embodiment, the controller connection management program executes, for example, processing shown in Fig. 6.

[0091]   That is, in step **S5** of the third embodiment, the controller connection management program first queries in step **S11**

20

the transceivers **35A** and **35B** about the number of the controllers connected thereto under radio connection.

[0092]   Next in step **S12**, the controller connection management program receives from the transceivers **35A** and **35B** the number of the controllers individually being connected thereto under radio connection.   For the case shown in Fig. 5 for example, the transceiver **35A** is under radio connection with the controller group **50A**, and the transceiver **35B** is under radio connection with the controller group **50B**, so that the controller connection management program receives from the transceiver **35A** the number of the controllers of "3", and from the transceiver **35B** the number of the controllers of "2".

[0093]   After receiving the number of the controllers, the controller connection management program then in step **S13** sends all of such numbers of the controllers respectively related to the transceivers **35A** and **35B** to the controllers **40a** to **40e** under radio connection through such transceivers **35A** and **35B**, or sends only the top numbers of the controllers respectively to the transceivers **35A** and **35B**, and makes such transceivers **35A** and **35B** to send such top numbers and the succeeding controller numbers to the controllers **40a** to **40e** under radio connection.

[0094]   More specifically for the case where all of the controller numbers are sent from the transceivers to the controllers under radio connection, the controller connection management program sends the controller numbers "1", "2" and "3" to the transceiver **35A**, and such transceiver **35A** then sends controller

21

number "1" to the controller **40a**, controller number "2" to the controller **40b** and controller number "3" to the controller **40c**.

[0095]   The controller connection management program also sends the controller numbers "4" and "5" to the transceiver **35B**, and such transceiver **35B** then sends controller number "4" to the controller **40d** and controller number "5" to the controller **40e**.

[0096]   On the other hand, for the case where only the top numbers of the numbers of the controllers are sent to the transceivers, and such top numbers and the succeeding numbers are sent from such transceivers to the controllers, the controller connection management program sends to the transceivers **35A** and **35B** the top numbers of the number of the controllers respectively connected thereto.

[0097]   The controller connection management program now defines an order of the allocation of the top numbers for the individual transceivers connected to the controller ports (or may previously be defined), and then sends such top numbers, not overlapping with each other, to the individual transceivers according to such order of the allocation.

[0098]   That is, in the third embodiment shown in Fig. 5, for the case the transceiver **35A** has the first priority for the allocation of the top number and the transceiver **35B** has the second priority, the controller connection management program sends to the transceiver **35A** a top number of "1", and sends to the transceiver **35B** a top number of "4" which is larger than "1" by 3 representing the number of the controllers connected to the transceiver **35A**.

[0099]   The transceivers **35A** and **35B** in such case are designed to send the received top numbers and the succeeding numbers in for example an ascending order. So that the transceiver **35A** sends for example a controller number of "1" to the controller **40a**, a controller number of "2" to the controller **40b** and a controller number of "3" to the controller **40c**; and the transceiver **35B** sends for example a controller number of "4" to the controller **40d** and a controller number of "5" to the controller **40e**.

[0100]   This results in displaying the controller number "1" on the display portion **41a** of the controller **40a**, the controller number "2" on the display portion **41b** of the controller **40b**, the controller number "3" on the display portion **41c** of the controller **40c**, the controller number "4" on the display portion **41d** of the controller **40d**, and the controller number "5" on the display portion **41e** of the controller **40e**.

[0101]   After completion of step **S13** in Fig. 6, the process goes to step **S6** in Fig. 2. The processes from steps **S6** to **S10** are basically the same with those described in the first and second embodiments. It is now also allowable to execute steps **S11** and **S12** other than ~~in elsewhere~~ before ~~in~~ step **S5** (after step **S1**, for example).

[0102]   Such processing allows the entertainment system of the third embodiment to recognize and manage the controllers connected in a one-to -multi manner, and to display the controller numbers on the display portions of the individual controllers. Thus according to the third embodiment, displaying the controller numbers on the display portions **41a** to **41e** of the respective controllers **40a** to **40e** allows each player to confirm ~~that~~ which

game character is controllable through the controller in ~~their~~its
own hands, similarly to the foregoing first and second embodiments.

Fourth Embodiment

[0103]   Fig. 7 shows an exemplary constitution of a fourth
embodiment in which a video game machine **30** and a plurality of
controllers (controllers **41a** to **41e**) communicate with each other
by one-to-multi, bi-directional radio connection using
transceivers, similarly to the case shown in Fig. 5.   The
constitution shown in Fig. 7 is basically the same with that shown
in Fig. 5, so that detailed description thereof will be omitted.

[0104]   It is now be noted that the case of the fourth embodiment
shown in Fig. 7 differs from the case of the third embodiment shown
in Fig. 5 in that the controller number is determined depending
on a maximum allowable number of the controllers under the radio
connection with the transceivers, in place of being determined
depending on the actual number of the controllers under the radio
connection with the individual transceivers at the controller
ports.

[0105]   Fig. 7 shows an exemplary case in which a maximum
allowable number of the controllers under the radio connection with
the individual transceivers **35A** and **35B** is set to "4", and the
controller numbers of "1", "2", "3", "5" and "6" are displayed
respectively on the display portions **41a** to **41e** of the controllers
40a to **40e**.

[0106]   The processing in step **S5** in Fig. 2 in the controller
connection management program of the fourth embodiment, in which
the controller numbers are determined depending on a maximum

24

allowable number of the controllers under the radio connection with the transceivers, will be explained referring to the flow chart shown in Fig. 6.

[0107]   It is now to be noted that the process flow by the controller connection management program in the fourth embodiment is approximately the same with that explained referring to the flow chart in Figs. 2 and 6, so that the description below will be given only about the issues different therefrom.

[0108]   The controller connection management program in the fourth embodiment queries in step **S11** in Fig. 6 the transceivers **35A** and **35B** on the side of the video game machine **30** about the maximum allowable number of the controllers connectable thereto.

[0109]   Next in step **S12**, the controller connection management program receives from the transceivers **35A** and **35B** the maximum allowable number of the controllers individually connectable thereto. That is, for an exemplary case the maximum allowable number of the connectable controllers is 4, the controller connection management program receives individually from the transceiver **35A** and **35B** a maximum allowable number for the connectable controllers of "4".

[0110]   After receiving such maximum allowable number for the connectable controllers, the controller connection management program then in step **S13** sends the controller number to the controllers **40a** to **40e** through the transceivers **35A** and **35B** in a number equals to such maximum allowable number for the controllers connectable to such transceivers **35A** and **35B**, or sends only the top controller numbers respectively to the transceivers **35A** and

25

35B, and <u>causes</u>~~makes~~ such transceivers **35A** and **35B** to send such

top numbers and the succeeding controller numbers to the controllers

40a to **40e**.

[0111]   More specifically for the case <u>where</u> the controller

numbers are sent from the transceivers to the controllers in a number

equals to such maximum allowable number for the controllers

connectable to such transceivers, the controller connection

management program sends the controller numbers "1", "2", "3" and

"4" to the transceiver **35A**, and sends the controller numbers "5",

"6", "7" and "8" to the transceiver **35B**. The transceiver **35A**

receiv<u>ing</u>~~ed~~ such controller numbers sends the controller numbers

"1", "2" and "3" to the controllers **40a**, **40b** and **40c** under radio

connection, while keeping the controller number "4" in pending since

the destination thereof is absent. The transceiver **35B** sends the

controller numbers "5" and "6" to the controllers **40d** and **40e** under

radio connection, while keeping the controller numbers "7" and "8"

in pending since the destinations thereof are absent.

[0112]   On the other hand, for the case <u>where</u> only the top

controller numbers are sent to the transceivers, and such top

numbers and the succeeding numbers are sent from such transceivers

to the controllers, the controller connection management program

sends to the transceivers **35A** and **35B** the top numbers of the maximum

allowable number of the controllers respectively connectable

thereto.

[0113]   The controller connection management program now

defines an order of the allocation of the top numbers of the maximum

allowable number for the connectable controllers for the individual

transceivers connected to the controller ports (or may previously be defined), and then sends such top numbers, not overlapping with each other, to the individual transceivers according to such order of the allocation.

[0114]   That is, in the fourth embodiment shown in Fig. 7, for the case the transceiver **35A** has the first priority for the allocation of the top number and the transceiver **35B** has the second priority, the controller connection management program sends to the transceiver **35A** a top number of "1", and sends to the transceiver **35B** a top number of "5" which is larger than "1" by 4 representing the maximum allowable number of the controllers connectable to the transceiver **35A**.

[0115]   The transceivers **35A** and **35B** in such case are designed to send the received top number and the succeeding numbers for example in an ascending order. So that the transceiver **35A** sends for example a controller number of "1" to the controller **40a**, a controller number of "2" to the controller **40b** and a controller number of "3" to the controller **40c**; and the transceiver **35B** sends for example a controller number of "5" to the controller **40d** and a controller number of "6" to the controller **40e**.

[0116]   This results in displaying the controller number "1" on the display portion **41a** of the controller **40a**, the controller number "2" on the display portion **41b** of the controller **40b**, the controller number "3" on the display portion **41c** of the controller **40c**, the controller number "5" on the display portion **41d** of the controller **40d**, and the controller number "6" on the display portion

27

41e of the controller 40e. The process then goes to step S6 in Fig. 2.

[0117]   Such processing allows the entertainment system of the fourth embodiment to recognize and manage the controllers connected in a one-to -multi manner, and to display the controller numbers on the display portions of the individual controllers.

[0118]   Also the fourth embodiment allows the players to confirm that which game character is controllable through the controller in their own hands, similarly to the foregoing third embodiment.

[0119]   It is now also allowable to assign the controller numbers to the controllers 40a to 40e in a descending order although the cases described in the foregoing third and fourth embodiments employed an ascending order.

[0120]   It is still also allowable to assign arbitrary controller numbers so far as such numbers do not overlap with each other and so far as the correlation with the game characters is evident, in place of allocating the successive numbers in an ascending or descending order.

[0121]   It is even allowable to display character icons on the display portions 41a to 41e similarly to the case in the first and second embodiments, in place of displaying the controller numbers.

Fifth Embodiment

[0122]   The next paragraphs describe a fifth embodiment of the present invention.

[0123]   Some previous application programs for video game machines do not have a function (program) for sending the controller numbers or character icons to the controllers unlike the controller

28

connection management program described in the first to fourth embodiments. Such previous application programs identify the controllers connected to a video game machine based on the position of the controller ports to which the controllers are connected. For example, a controller connected to a port having a port number of "1" is identified as controller "1", and a controller connected to a port having a port number of "2" is identified as controller "2".

[0124]	Such numbering for the controllers is, however, only used internally by the application program to identify the controllers, and there is no practice to send such controller numbers to the controllers unlike the foregoing embodiments.

[0125]	It is also common for the transceiver (e.g., transceivers 32A and 32B in Fig. 4) connected to the controller port of the video game machine to have only a function of sending/receiving data in order to suppress the cost and enhance the generality, and generally does not have a function of recognizing the port numbers to which they are connected and of sending such numbers to the controller.

[0126]	So that even if the transceivers 32A and 32B for example as shown in Fig. 4 are connected to the controller ports of the video game machine, and the controllers 40A and 40B as shown in Fig. 4 are used, the controller numbers cannot be displayed on the display portions 41A and 41B of such controllers 40A and 40B as far as the video game machine employs the previous application program having no function of sending the controller numbers.

[0127]   Then the fifth embodiment now employs, as shown in Fig. 8, transceivers **62A** and **62B** with connector portions **63A** and **63B** which have switches **65A** and **65B** with which the players can set the numbers and also have built-in communication circuits capable of sending the controller numbers corresponding with the setting of such switches **65A** and **65B**. Attaching such transceivers **62A** and **62B** to controller ports **61A** and **61B** of a video game machine **60** running the previous application program allows the controller numbers to be displayed on the display portions **41A** and **41B** of the controllers **40A** and **40B**, respectively.

[0128]   The case illustrated in Fig. 8 corresponds to that in Fig. 4, so that explanation for portions same as those in Fig. 4 will be omitted.

[0129]   Fig. 9 shows an enlarged view of a transceiver **62** (**62A** or **62B**).

[0130]   In Fig. 9, the transceiver **62** (**62A** or **62B**) mainly comprises a radio communication antenna **64** (**64A** or **64B**) and a connector portion **63** (**63A** or **63B**), similarly to the transceiver shown in Fig. 4.

[0131]   At the end portion of the connector portion **63** opposing to an antenna **64**, provided is a contact portion **66** to be inserted into a controller port **61** (**61A** or **61B**) to thereby achieve electrical connection. The connector portion **63** also has a switch **65** (**65A** or **65B**) in a position readily recognizable by the player and preferably accessible by the player even when the contact portion **66** is inserted into the controller port **61**.

[0132] The switch 65 has setting positions in a number corresponding with the number of the controller ports of the video game machine to which the transceiver 62 is connected. For a case the number of the controller port of the video game machine 60 is two for example as shown in Fig. 8, the switch 65 will have two setting positions of "1" and "2" as shown in Fig. 9; whereas the number of the controller port of four requires such switch to have setting positions of "1" to "4".

[0133] Switching of the positions of such switch 65 is manually done by the player. For example, the position "1" is selected for the case the transceiver 62 is inserted into the controller port of the video game machine having a port number of "1", and the position "2" is selected for the case such transceiver 62 is inserted into the controller port having a port number of "2".

[0134] The communication circuit incorporated into the connector portion 63 generates a controller number corresponding to a position selected on the switch 65, and then sends such number from the radio communication antenna 64 to the controller 40 (40A or 40B).

[0135] This allows the display portion 41 of the controller 40 under one-to-one radio communication with the transceiver 62 to display the controller number sent from such transceiver 62.

[0136] In an exemplary case shown in Fig. 8 assuming a port number of the controller port 61A of the video game machine 60 as "1", and a port number of the controller port 61B as "2", the switch 65A on the transceiver 62A will be set at position "1", and the switch 65B on the transceiver 62B will be set at position "2", which

31

results in the display of a controller number of "1" on the display portion **41A** of the controller **40A** under one-to-one communication with the transceiver **62A**, and results in the display of a controller number of "2" on the display portion **41B** of the controller **40B** under one-to-one communication with the transceiver **62B**.

[0137]   Now in such fifth embodiment, the connector portion **63** of the transceiver **62** shown in Fig. 9 is explained as that sending to the controller **40** the controller numbers corresponding to the position of the switch **65**, where the controller numbers specified by the controller connection management program can preferentially be sent rather than the controller numbers based on the position of the switch **65** when such transceiver **62** is connected to a video game machine supported by, for example, the controller connection management program described in the second embodiment.

[0138]   That is, mounting the transceiver **62** shown in Fig. 9 onto a video game machine supported by such controller connection management program allows such transceiver **62** to send the controller number to the controller when such controller numbers are specified by the video game machine, and to send the controller number corresponding to the position set by the switch **65** when the controller number are not specified by the video game machine.

[0139]   Thus according to the entertainment system according to the fifth embodiment, the controller number is displayed on the display portion **41** of the controller **40** irrespective of whether the video game machine supports the controller connection management program or not.

Sixth Embodiment

[0140]   While the foregoing fifth embodiment showed an exemplary case in which the one-to-one radio communication is established between the transceiver **62** on the video game machine **60** not supported by the previous controller connection management program and the transceiver **42** on the controller **40**, such transceiver having the switch **65** mounted thereon is also applicable to the one-to-multi radio communication between a video game machine not supported by the foregoing controller connection management program and the controllers, as described in the sixth embodiment shown in Fig. 10.

[0141]   The case illustrated in Fig. 10 corresponds to that in Fig. 5 or Fig. 7, so that explanation for portions same as those in Fig. 5 or Fig. 7 will be omitted.

[0142]   In one-to-multi communication as described in the sixth embodiment, a communication circuit incorporated in the connector portion **63** (**63A**, **63B**) of the transceiver **66** (**66A**, **66B**) reads a positional set value (i.e., number) of the switch **65** (**65A**, **65B**), and then sends to each of the controller **40** under the radio communication therewith the controller number comprising the read value and a specific number differs for every controller.

[0143]   This allows the display portions **41** of each controller **40** under one-to-multi radio communication with the transceivers **62** to display the controller number sent from the corresponding transceivers **62**.

[0144]   In an exemplary case shown in Fig. 10 assuming that the controller port **61A** of the video game machine **60** has a port number of "1", and the controller port **61B** has a port number of "2"; the

switch **65A** on the transceiver **66A** will be set at position "1", and the switch **65B** on the transceiver **66B** will be set at position "2"; the controllers **40a**, **40b** and **40c** in the controller group **50A** under one-to-multi communication with the transceiver **66A** will be given with "1", "2" and "3", respectively as numbers differ for every controller, and the controllers **40d** and **40e** in the controller group **50B** under one-to-multi communication with the transceiver **66B** will be given with "1" and "2", respectively; which results in the display of a controller number of "1-1" on the display portion **41a** of the controller **40a** in the controller group **50A**, a controller number of "1-2" on the display portion **41b** of the controller **40b**, and a controller number of "1-3" on the display portion **41c** of the controller **40c**, and results in the display of a controller number of "2-1" on the display portion **41d** of the controller **40d** and a controller number of "2-2" on the display portion **41e** of the controller **40e**.

[0145]   Now also in such sixth embodiment, for the case that the transceiver **66** is connected to the video game machine supporting the controller connection management program as descried in the third or fourth embodiment, it is allowable to give priority to sending of the controller numbers specified by such controller connection management program over the sending of the controller numbers based on the positional setting of the switch **65**, similarly to the fifth embodiment.

[0146]   Thus according to the entertainment system of the sixth embodiment, the controller number is displayed on the display portion **41** of the controller **40** irrespective of whether the video

game machine supports the controller connection management program or not.

[0147]   Fig. 11 shows an exemplary case of a communication circuit of the transceiver having the switch described in the fifth and sixth embodiments, in which the video game machine can send the controller numbers irrespective of whether such video game machine supports the controller connection management program or not. A process flow shown in Fig. 11 now can be achieved by a software or a hardware, either will do, within the communication circuit of the transceiver.

[0148]   As shown in Fig. 11, the communication circuit of the transceiver establishes in step **S21** the connection by radio communication between the video game machine and at least one controller, and then judges in step **S22** whether the application program of the video game machine specified the controller number or not. For the case where the application program of the video game machine is supported by the controller connection management program and thus the controller number is judged in step **S22** as being specified by the video game machine, the communication circuit will send in step **S23** the controller number specified by such application program supported by the controller connection management program to the corresponding controller, and then goes to a communication processing routine for playing an actual game or the like.

[0149]   On the other hand, the processing goes to step **S24** if the communication circuit judges in step **S22** that the application program of the video game machine is not supported by the controller

connection management program and the controller number is thus not specified by such video game machine.

[0150]   In step **S24**, the communication circuit detects what position is selected on the switch, and then detects in step **S25** the number of the controllers with which the radio communication has already been established.

[0151]   When the number of the controllers detected in step **S25** is "1", the processing of the communication circuit goes to step **S27**, and is not "1" (i.e., "2" or above), to step **S28**.

[0152]   The processing jumping from step **S25** to step **S27** corresponds to a case of one-to-one communication as in the fifth embodiment, and that jumping from step **S25** to step **S28** corresponds to a case of one-to-multi communication as in the sixth embodiment.

[0153]   The communication circuits sends the controller number according to the position of the switch to the corresponding controller in step **S27**, and then goes into a communication processing routine for playing an actual game or the like.

[0154]   On the contrary in step **S28**, the communication circuit generates the number corresponding to the number of the controllers with which the radio communication has already been established, and then sends in step **S29** the controller number, comprising the number corresponding to the position of the switch added with the number corresponding the number of the controllers, to the corresponding controller. Thereafter the process goes into a communication processing routine for playing an actual game or the like.

[0155]   The transceiver described in the fifth and sixth embodiments is thus accomplished.

[0156]   Fig. 12 shows an overall constitution of the entertainment system comprising the video game machine and the controller according to any one of the foregoing embodiments. While Fig. 12 exemplifies the case in which the video game machine and the controller are under radio communication as explained in the second to sixth embodiments, the video game machine and the controller may be under cable connection using the cable as explained in the first embodiment.

[0157]   The entertainment system shown in Fig. 12 comprises a video game machine **101** (**10, 30, 60**) corresponding to that in the foregoing embodiments, a controller **102** (**20, 40**) corresponding to that in the foregoing embodiments, and a monitor device **100** (television receiver, for example) to which video and audio signals are supplied from the video game machine **101**.

[0158]   The video game machine **101** is provided with memory card slots **114A** and **114B** allowing a memory card **103** to be inserted therein and ejected therefrom, controller ports **115A** and **115B** (**11, 31, 61**) allowing a transceiver **107** (**32, 35, 62, 66**) such as those described in the foregoing embodiments and a cable plug-in connector (not shown) to be attached thereto or detached therefrom, a disk tray **113**, an open/close button **112** for opening or closing the disk tray **113**, and an ON/stand-by/reset button **111** for effecting power supply, stand-by and reset; and further comprises, although not shown, an audio/video output terminal (AV multi output terminal), a PC card slot, an optical digital output terminal, an IEEE (Institute of

37

Electrical and Electronics Engineers) 1394 connection terminal, an USB (Universal Serial Bus) connection terminal, a power switch, an AC power input terminal and so forth.

[0159]   The individual connection terminals including the controller port **115** preferably have asymmetrical openings so as to avoid incorrect insertions.

[0160]   The video game machine **101** may be such that executing a video game based on an application program thereof stored in a disk-formed medium such as so-called DVD-ROM or CD-ROM, or such that reproducing (decoding) video data or audio data stored for example in a DVD video or CD. For the case the application program thereof contains the foregoing controller connection management program, the video game machine **101** can also send the foregoing controller numbers or so to the controller while being controlled by such program.

[0161]   Now the application program, video data and audio data are not limited to those stored in a disk medium, but may also be those read out from semiconductor memories or tape media, or those supplied through cable or radio, wide-area or private communication lines.

[0162]   The appearance of the controller **102** will now be explained referring to Fig. 13.

[0163]   The controller **102 has** a connection port **131** to which a transceiver **135 (42)** such as that explained in the foregoing embodiments, and a display portion **130 (21, 41)** capable of displaying the controller numbers or character icons. The

connection port **131** preferably has an asymmetrical openings so as to avoid incorrect insertions.

[0164]   The controller **102** has a right grip portion **122** held as being wrapped by the right palm, and a left grip portion **121** held as being wrapped by the left palm.

[0165]   The controller **102** also has a right operational zone **128** and left operational zone **126** operable by the left and right thumbs while the grip portions **121** and **122** being held in hands; a right analog operation portion **124** and a left analog operation portion **123** again operable by the left and right thumbs in an analog manner; a first right push button **148** and a first left push button **145** operable by left and right first fingers; and a second right push button **147** and a second left push button **146** operable by left and right second fingers.

[0166]   In the left operational zone **126**, an up button **142**, a down button **144**, a left button **143** and a right button **141** are provided, all of which are used by the player to move, for example, a game character on the display screen. The right operational zone **128** has first to fourth operation buttons **150** to **153** to which functions differ with each other, such as setting of the character functions or execution thereof, are assigned by the game application.

[0167]   The left and right analog operation portions **123** and **124** have right and left rotary operation elements **125** and **126**, respectively, which are fully rotatable around the operation axis and automatically returnable to the neutral position energized by an elastic member when released from the thumb, and individually have a signal generating portion, not shown, capable of generating

signals corresponding to the operation of such left and right rotary operation elements **125** and **126**.

[0168]   The left and right analog operation portions **123** and **124** are used for inputting command signals for effecting, typically by rotary operation of such left and right rotary operation elements **125** and **126**, analogous motion of the game characters such as moving with rotation, moving with variable velocity and transformation.

[0169]   The controller **102** is further provided with a mode selection switch **137** for activating or inactivating the functions of the left and right rotary operation elements **125** and **126**, a light indicator portion **136** for allowing the player to recognize a selected operation mode typically through illumination of an LED (light emitting diode), a start button **134**, selection button **133**, and the like.

[0170]   The mode selection switch **137** is also used for switching the functions of the right operational zone **128** and the left operational zone **126**.

[0171]   The controller **102** also has the display portion **130** explained in the foregoing embodiments at a position well recognizable by the player, typically between the right operational zone **128** and the left operational zone **126**, and the connection port **131** to or from which the foregoing transceiver **135** or a cable connector is attached or detached.

[0172]   The controller **102** further has, in the left and right grip portions **121** and **122**, a vibration generating mechanism for generating vibration by, for example, rotating a weight around the axis of rotation of a motor while being kept eccentric therefrom,

although not shown in Fig. 13. Activating such vibration generating mechanism in relation to the state of progress of the game will cause vibration felt by the player's hands.

[0173]   Fig. 14 shows a principal internal constitution of the video game machine **101** and the transceiver **107**.

[0174]   In the case shown in Fig. 14, the video game machine **101** mainly comprises a control section **161** for controlling the individual internal constitutional elements, an image processing section **169** for processing images, an audio processing section **167** for audio processing, a communication processing section **162** responsible for communication, a disk drive **172** for driving a disk medium and a decode processing section **171** for decoding data read out from such disk medium.

[0175]   The control section **161** typically comprises a CPU (central processing unit) and peripheral devices thereof such as a ROM or RAM, and a transmission control section responsible for interrupt control and direct memory access (DMA) transmission control. The ROM stores an operating system (OS) for managing operations of the image processing section **169** and the audio processing section **167**, and other initial set values. The CPU controls the entire operations of the video game machine **101** by executing such operating system stored in the ROM.

[0176]   The image processing section **169** comprises a graphic processor unit (GPU), a geometry transfer engine (GTE), a frame buffer, an image decoder and so forth. The geometric transfer engine typically executes coordinate transformation including perspective projection transformation, and the graphic processor

unit executes drawing based on drawing instruction from the CPU in the control section 161. The frame buffer stores an image drawn by such graphic processor unit, and stores a frame image to be displayed on the television monitor. The image decoder decodes image data decoded as being compressed based on image compression system such that represented by MPEG (Moving Picture Experts Group) standard.

[0177]   The audio processing section 167 comprises a sound processor unit (SPU), a sound buffer and so forth. The sound processor unit has a function of generating audio data such as music or effective sound and a function of decoding audio data decoded as being compressed based on MPEG Audio or ATRAC (Adaptive TRansform Acoustic Coding; trademark) under the instruction from the CPU in the control section 161. The sound buffer stores waveform data providing a basis on which audio data is generated by the sound processor unit.

[0178]   The image data generated by the image processing section 169 and the audio data generated by the audio processing section 167 are output from an audio/video output terminal (AV multi output terminal) 170 and then sent to, for example, a television monitor.

[0179]   When the disk medium storing the foregoing game application program or video/audio data is set and reproduction is instructed by the control section 161, the disk drive 172 reads out data from such disk and then sends them to the decoding section 171.

[0180]   The decoding section 171 decodes (correcting error of the data coded by error correction coding) the data read out from

the disk medium, buffers them and then sends them to the control section **161**. Now for the case the data supplied from the decoding section **171** relate to a game application program, the control section **161** allows the image processing section **169** and audio processing section **167** to operate responding to such game application program. For the case the data supplied from the decoding section **171** are video or audio data, the control section **161** sends such data to the corresponding image processing section **169** or audio processing section **167**.

[0181]   The video game machine **101** also has a communication section **162** responsible for communication with the controller **102** through the foregoing controller port **115**, or for communication through an interface terminal **164** such as memory card slots **114A**, **114B**, a PC card slot, an optical digital output terminal, an IEEE 1394 connection terminal and an USB (Universal Serial Bus) connection terminal. The controller port **115** is connected with, for example, the foregoing connection portion **181** (**66**) of the transceiver **107**, and the communication section **162** receives, in a synchronous manner, commands input through the controller **102** by the player.

[0182]   The transceiver **107** comprises a communication circuit section **182** for effecting bi-directional radio communication, an antenna **184** (**34**, **64**), and, at need, a switch **183** (**65**) explained in the fifth and sixth embodiments. For the case where the switch **183** is provided, as explained in the fifth and sixth embodiments, the communication circuit section **182** also executes controller

number generation processing as explained previously referring to Fig. 11.

[0183]   Fig. 15 shows a principal internal constitution of the controller **102** and the transceiver **135**.

[0184]   In the case shown in Fig. 15, the controller **102** comprises, as major constituents, a control section **201** responsible for a control of operations of the individual sections and communication with the video game machine **101**, a parallel interface section **203** responsible for parallel communication between various operational sections or buttons **PB** and the control section **201**, a serial interface section **206** responsible for serial communication with the video game machine **101** through transceiver **135** or a cable, a display driver **202** driving display portion **130**, a motor **204** composing the foregoing vibration generating mechanism and a motor driver **205**. For the case where the controller **102** and the video game machine **101** are connected by radio communication through the transceiver **135**, power is internally supplied from a battery **207**. On the other hand, the battery **207** is not always necessary for the case where the video game machine **101** and the controller **102** are connected by a cable and that power is thus supplied from such video game machine **101** through such cable.

[0185]   The control section **201** typically comprises a CPU and ROM or RAM, where the ROM stores a detection program for detecting input statuses from the various buttons **PB**, a driver control program for controlling the display driver **202** and the motor driver, a communication program for processing communication with the video

game machine 101 and so forth. The internal CPU controls the individual sections based on such programs.

[0186]   The serial interface section 206 and the connection port 209 are connected by a signal line **TXD** (Transmit Data) for transmitting data sent from the video game machine 101 to the controller 102, a signal line **RXD** (Received Data) for transmitting data from the controller 102 to the video game machine 101, a signal line **SCK** (Serial Clock) for sending serial synchronous clock for extracting data from the signal lines **TXD** and **RXD** for the individual data transmission, a control line **DTR** (Data Terminal Ready) for establishing or interrupting the communication with the controller 102, and a control line **DSR** (Data Set Ready) for flow control for transmitting a large volume of data.

[0187]   It is now necessary to provide a power supply line, although not shown, when the controller 102 and the video game machine 101 are connected with a cable and power is supplied from such video game machine 101 through such cable.

[0188]   The transceiver 135 has a communication circuit section 222 responsible for bi-directional radio communication, an antenna 223 (44) and a serial interface section 221.

[0189]   While the description for the above embodiment dealt the case that the present invention is applied to the video game machine and the controller thereof, the present invention is also applicable to purposes other than such video game machine and the controller.

[0190]   The embodiments described in the above are only part of the examples of the present invention.   It is therefore to be

understood that the present invention may be practiced otherwise than as specifically described herein without departing from the scope and the spirit thereof.